Abstract for 2016 DOE Natural Phenomena Hazards Meeting and Training Session, October 2016, Germantown, MD

Development and Application of the Seismic Hazard Periodic Reevaluation Methodology for Meeting DOE O 420.1C

Annie Kammerer, *Annie Kammerer Consulting*
Kevin Coppersmith, *Coppersmith Consulting*
Justin Coleman, *Idaho National Laboratory*
Suzette Payne, *Idaho National Laboratory*
Nilesh Chokshi, *NCChokshi Consulting*
Robert Budnitz, *Lawrence Berkeley National Laboratory*

The topic of this paper is the development and application of a new methodology for the periodic reevaluation of the seismic safety of certain U.S. Department of Energy (DOE) nuclear facilities. DOE Order, DOE O 420.1C, establishes programmatic and facility requirements for natural phenomena hazard mitigation, including criteria for seismic assessment at sites of existing nuclear facilities with seismic design category-3 (SDC-3) or higher. The Order points the reader to Standard DOE-STD-1020-2012 for criteria considered in a periodic reevaluation. In addition to discussing the applicable evaluation criteria, the Standard references other documents, such as American National Standards Institute/American Nuclear Society Standard ANSI/ANS-2.29-2008 and NRC guidance reports NUREG-2117 and NUREG/CR-6372. These documents provide additional supporting criteria and approaches for evaluating the need to update an existing probabilistic seismic hazard assessment (PSHA).

The above documents are consistent at a high level regarding the general conceptual criteria that should be considered. However, none of the documents provides step-by-step detailed guidance. Further, all of the approaches and criteria given in these documents address changes that may impact the PSHA, the calculated hazard itself, or the technical basis for the hazard inputs. However, the DOE Order is aimed at achieving and assuring the *safety* of nuclear facilities—which is a function of both the seismic hazard and the seismic capacity of the facility.

To address the limitations of the available guidance, the Idaho National Laboratory (INL) undertook activities to develop and apply a risk-informed approach to meeting the Order. These activities included organizing the INL Seismic Risk-Informed Methodology Independent Panel, which developed a new methodology termed the “seismic hazard periodic reevaluation methodology” or SHPRM). This paper has been drawn from the resulting report (INL/EXT-15-36510), as well as the evaluation report discussed below.

The SHPRM was applied at INL’s Materials and Fuels Complex (MFC) for two existing SDC-3 facilities. These facilities are the Fuel Manufacturing Facility (FMF) and Zero Power Physics Reactor (ZPPR). The application of the SHPRM at the FMF and ZPPR started with a PSHA study conducted using the Senior Seismic Hazard Analysis Committee (SSHAC) guidelines for a Level 1 study, consistent with recommendations in the SHPRM Report. Once the SSHAC Level 1 PSHA was conducted, the review criteria that form the backbone of the SHPRM were evaluated.

Criteria #1 to #4, are focused on earth science-related evaluations that come directly from DOE-STD-1020-2012 and its supporting documents. For this project, an approach was developed to systematically evaluate Criteria #1 to #4 and clearly document the outcomes. Criteria #5 through #7 are focused on understanding the safety and risk implications of new hazard information. The evaluation of criteria #5 through #7 requires that both the baseline PSHA study and the Design Basis Ground Motions (DBGM) of the facility be determined and documented. The approach to evaluating Criteria #5 to #7 was developed in INL evaluation project to clearly document the technical path from ground motion to demonstration of safety for each of the facilities. The evaluation process and outcomes is detailed in INL/EXT-16-37751.